

## Index to Volume 2

January–December 1967

**A**

	Page
Admittance dependence of the infinite cylindrical antenna upon exciting gap thickness.....	1431
Admittance of cylindrical antennas driven from a coaxial line.....	1031
Admittance of a plasma-covered cylindrical antenna.....	203
Airborne field strength measurements in the region of the NPM antipode.....	581
Amplitude, HG ground backscatter, computation of.....	739
Amplitude variations of the 19.8 kHz field of NPM near its antipode, measured.....	669
Analytic solution.....	821
Anisotropic medium, aperture fields in an.....	837
Anisotropic plasma, reflection of circularly polarized electromagnetic waves from.....	881
Anisotropic regions with boundaries, ray optics for radiation problems in, I. Line source excitation.....	769
Anomalous sunrise effects observed on a long transequatorial VLF propagation path.....	521
Antenna, admittance dependence of the infinite cylindrical, upon exciting gap thickness.....	1431
Antenna, aperture, in an infinite conducting plane, effect of thin plasmas on.....	87
Antenna array, infinite, finite scattering matrix for.....	19
Antenna arrays with nonuniform spacings, beam efficiency and gain optimization of.....	711
Antenna, balanced helical wire, theory of.....	167
Antenna, cylindrical, plasma-covered, admittance of.....	203
Antenna, cylindrical, with tapered resistive loading.....	191
Antenna, electrically thick cylindrical.....	1043
Antenna height determination of, for protection against microwave diffraction fading.....	161
Antenna, infinite cylindrical dielectric-coated.....	325
Antenna, log-periodic dipole.....	1315
Antenna, on the exact theory of a prolate spheroidal receiving and scattering.....	351
Antenna patterns for an inhomogeneous spherical earth, on the calculation of.....	1361
Antenna, problem of the infinite, in an anisotropic plasma.....	495
Antenna, proof that a phased array, can be impedance matched for all scan angles.....	361
Antenna, radiation of, in a compressible magnetoplasm.....	757
Antennas, thick tubular transmitting.....	1061
Antennas, cylindrical, the admittance of, driven from a coaxial line.....	1031
Antennas, dipole, quasi-static fields located above the earth's surface.....	1093
Antenna, short, computations of the resistance of, in a warm plasma.....	73
Antenna, theory, digital computer solutions of Fredholm integral equations of the first and second kind occurring in.....	1067
Antenna, transmission and reception properties of an equatorial slot, on a reentry sphere.....	337
Antipode, airborne field strength measurements in the region of the NPM.....	581
Aperture antenna in an infinite conducting plane, effect of thin plasmas on.....	87
Aperture fields in an anisotropic medium.....	837
Aronson, E. A., C. W. Harrison, Jr., C. D. Taylor, E. E. O'Donnell, On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory.....	1067
Array factors with nonuniform spacing and amplitude parameters, moment synthesis of.....	721
Arrays of unequal and unequally spaced dipoles.....	1303
Atmosphere, horizontally stratified, rapid and accurate ray tracing algorithm for.....	249
Atmospheric attenuation at millimeter wavelengths.....	319
Atmospheric Noise from 20 Hz to 30 kHz.....	637
Atmospheric radio refraction, a nomogram for.....	1113
Atmospheres, VLF transmission loss through spectral analyses of.....	139
Atomic frequency standards, five years of VLF worldwide comparison of.....	627
Attenuation, atmospheric, at millimeter wavelengths.....	319
Attenuation calculations, graphical, for irregular terrain (digest).....	1109
Attenuation function for propagation over a highly inductive earth, groundwave.....	687
Attenuation, VLF, rates deduced from aircraft observations near the antipode of NPM.....	575
Auroral ionosphere, results from an RF capacity probe experiment in.....	1283

**B**

Bachynski, M. P., B. W. Gibbs, K. A. Graf, Reflection of circularly polarized electromagnetic waves from an anisotropic plasma.....	881
Backscatter, computation of HG ground, amplitude.....	739
Bahar, E., Generalized scattering matrix equations for waveguide structures of varying surface impedance boundaries.....	287
Bannister, P. R., Quasi-static fields of dipole antennas located above the earth's surface.....	1093
Bassanini, P., Wave propagation in a one-dimensional random medium.....	429
—, C. Cercignani, F. Sergagniotti, G. Tironi, Scattering of waves by a medium with strong fluctuations of refractive index.....	1
'beam' efficiency and gain optimization of antenna arrays with nonuniform spacings.....	711
Jean, B. R., C. B. Emmanuel, R. W. Krinks, Some spectral characteristics of the radio refractivity in the surface layer of the atmosphere.....	503
Becker, W., On the manual and digital computer methods used at Lindau for the conversion of multifrequency ionograms to electron density-height profiles.....	1205

	Page
Beckmann, P., Estimation of the number of unresolvable targets producing a single radar return.....	955
Bekerman, C., J. A. Waletzko, RF admittance measurements of a slotted-sphere antenna immersed in a plasma.....	489
Bickel, J. E., VLF attenuation rates deduced from aircraft observations near the antipode of NPM.....	575
—, F. P. Snyder, Measured amplitude variations of the 19.8 kHz field of NPM near its antipode.....	669
Biorthogonal expansions for the linearized anisotropic multifluid warm plasma equations.....	927
Biorthogonality relations and related formulas.....	937
Blair, B. E., E. L. Crow, A. H. Morgan, Five years of VLF worldwide comparison of atomic frequency standards.....	627
Bolle, D. M., General mode structure and resonant frequencies for ferrite-loaded circularly cylindrical cavity resonators.....	681
Boundary value problems, solutions of: radiation and scattering problems in compressible plasmas, II.....	53
Bouman, J. J., T. B. A. Senior, Diffraction of a dipole field by a perfectly conducting half-plane.....	1339
Brady, M. M., Note on the tabular presentation of the radio refractive index as a function of meteorological parameters.....	1523
Branch curve contributions to the far fields.....	793
Burgess, B., T. B. Jones, Solar flare effects and VLF radio wave observations of the lower ionosphere.....	619
—, J. T. Rausch, Results of the two-frequency VLF transmission on experiments from Criggion GBZ.....	1295
Butler, J. K., H. Unz, Beam efficiency and gain optimization of antenna arrays with nonuniform spacings.....	711
 <b>C</b>	 1327
Cacavas, P. C., G. Tyras, Note on the potential of a vertical electric dipole over the interface between two lossy media.....	511
Calculation of the virtual height and absorption of radio waves in the ionosphere, calculations, graphical attenuation, for irregular terrain (digest).....	133
Carlin, J., R. Mittra, Effects of induced acoustic sources on the impedance of a cylindrical dipole in a warm plasma.....	1109
Cercignani, C., F. Sergagniotti, G. Tironi, P. Bassanini, Scattering of waves by a medium with strong fluctuations of refractive index.....	1
Cerenkov radiation in an infinite magnetoplasm, utilization of the refractive index surfaces to evaluate.....	703
Chang, D. C., On the electrically thick cylindrical antenna.....	1043
Chaula, B. R., D. Kalluri, H. Unz, Propagation of oblique electromagnetic waves through a warm plasma slab with normal magnetostatic field.....	869
Chen, C.-L., Theory of the balanced helical wire antenna.....	167
Cheung, W. M., R. W. P. King, Arrays of unequal and unequally spaced dipoles.....	1303
—, —, Log-periodic dipole antenna.....	1315
Christiansen, S., T. Larsen, Numerical application of the compensation theorem to mixed-path propagation problems.....	1471
Circular cylinders, that inhomogeneous, electromagnetic scattering by.....	729
Coaxial line, admittance of cylindrical antennas driven from.....	1031
Comments on a paper "Electromagnetic Scattering From Rough Finely Conducting Sources" by A. Stogryn.....	1525
Compensation theorem, numerical application, to mixed-path propagation problems.....	1471
Compressible magnetoplasm, radiation of an antenna in.....	757
Compressible plasmas, radiation and scattering problems in, I. solutions by ray optics.....	29
Compressible plasmas, radiation and scattering problems in, II. solutions of boundary value problems.....	53
Computation and application of synoptic ionospheric profiles.....	1255
Computation of HG ground backscatter amplitude.....	739
Computation of the resistance of a short antenna in a warm plasma.....	73
Computer methods, manual and digital, used at Lindau for the conversion of multi-frequency ionograms to electron density-height profiles.....	1205
Computer solutions, digital, of Fredholm integral equations of the first and second kind occurring in antenna theory.....	1067
Conductivity, semi-infinite, an integral equation approach to scattering from a body of.....	1459
Cone, semi-infinite, scattering from resonant slots on.....	1437
Cook, K. R., G. L. Johnson, Problem of the infinite antenna in an anisotropic plasma.....	495
Corona currents after the return stroke and the emission of ELF waves in a lightning flash to earth.....	241
Corona currents, note on, in a lightning discharge and the emission of ELF waves.....	1394
Coupled equations for electroacoustic waves.....	1401
Croft, T. A., Computation of HG ground backscatter amplitude.....	739
Crombie, D. F., K. Steele, Frequency dependence of VLF fading at sunrise.....	547
Crow, E. L., B. E. Blair, A. H. Morgan, Five years of VLF worldwide comparison of atomic frequency standards.....	627
Curtz, T. B., A. L. Maffett, Moment synthesis of array factors with nonuniform spacing and amplitude parameters.....	721
Cylindrical antenna, plasma-covered, admittance of.....	203

Cylindrical antenna with tapered resistive loading.....  
 Cylindrical antennas, the admittance of, driven from a coaxial line.....  
 Cylindrical impedance probe for magnetoplasma, further note on the quasi-static theory of.....

**D**

*Davies, K.*, A nomenclature for oblique ionospheric soundings and ray tracing.....  
 de *Lisie, J. M.*, A note on the reflection coefficient of a sharply bounded ionosphere for VLF signals at the magnetic equator.....  
 Dellingen, John Howard, Memorial lecture.....  
*de Mendonca, F., R. R. Scarabucci*, Phase measurements of VLF transmissions over an 11,000-km transcontinental path.....  
 Depolarization of lunar radar echoes, study of.....  
 Depolarization of radar backscatter, field theory of, with application to a distant, slightly rough sphere.....  
*Deschamps, G. A., O. B. Kesler*, Radiation of an antenna in a compressible magnetoplasma.....  
 Description of dipole fields, a note on the.....  
 Determination of antenna height for protection against microwave diffraction fading.....  
*deWolff, D. A.*, Multiple scattering in a random continuum.....  
 —, Spherical wave propagation through a random continuum.....  
 Dielectric-coated antenna, infinite cylindrical.....  
 Dielectric rod, electromagnetic whispering gallery modes in a dielectric rod.....  
 Diffraction by a cylinder in a locally uniaxial medium with azimuthal optic axis.....  
 Diffraction of a dipole field by a perfectly conducting half plane.....  
 Dipole field, diffraction of, by a perfectly conducting half plane.....  
 Dipole fields, a note on the description of.....  
 Dipole, note on the potential of a vertical electric, over the interface between two lossy media.....  
 Dipole, raised electric, on the theory of, over an inhomogeneous ground plane.....  
 Dipoles, arrays of unequal and unequally spaced.....  
 Dipoles, radiation from, in an idealized jungle environment.....  
 Direct manual calculations of ionospheric parameters using a single-polynomial analysis.....  
 Direct use of the phase refractive index for reducing h'(f) curves to N(h) profiles.....  
 Dispersion relation in compressible plasma.....  
 Diurnal changes of phase and group velocity of VLF radio waves.....  
 Diurnal phase change of VLF signals propagated over long paths.....  
*Doherty, R. H.*, Oblique incidence ionospheric reflections of 100 kHz pulses.....  
*Dougherty, H. T., R. E. Wilkerson*, Determination of antenna height for protection against microwave diffraction fading.....  
*DuFort, E. C.*, Finite scattering matrix for an infinite antenna array.....

**E**

Earth, inhomogeneous spherical, illumination of, by an LF plane electromagnetic wave.....  
 Earth-ionosphere cavity, resonances of the thin-shell model, with a dipolar magnetic field.....  
 Echoes, lunar radar, a study of the depolarization of.....  
 Effect of thin plasmas on an aperture antenna in an infinite conducting plane.....  
 Effects of induced acoustic sources on the impedance of a cylindrical dipole in a warm plasma.....  
*Edeland, A., E. Naustvik*, The influence of high-latitude disturbances on VLF propagation.....  
*Eichmann, G.*, Scaling for rotationally symmetric potential in uniaxial media.....  
 Electrically thick cylindrical antenna.....  
 Electroacoustic waves, coupled equations for.....  
 Electrodynamics of moving media, present views on.....  
 Electromagnetic plane wave scattering from a plasma-coated conducting cylinder.....  
 Electromagnetic radiation in a moving lossy medium.....  
 Electromagnetic reflection by nonuniform jet streams.....  
 Electromagnetic scattering by thin inhomogeneous circular cylinders.....  
 Electromagnetic scattering from rough, finitely conducting surfaces.....  
 Electromagnetic wave scattering from a cylinder immersed in a warm plasma.....  
 Electromagnetic waves, circularly polarized, reflection of from an anisotropic plasma.....  
 Electromagnetic waves, propagation of, into anisotropic media from an external point-dipole source.....  
 Electromagnetic waves, propagation of, near a coastline on a flat earth.....  
 Electromagnetic waves through a warm plasma slab with normal magnetostatic field.....  
 Electromagnetic whispering gallery modes in a dielectric rod.....  
 Electron density-height profiles, manual and digital computer methods used at Lindau for the conversion of multifrequency ionograms to.....  
 Electron density profiles, ionospheric, with continuous gradients and underlying ionization corrections: I. The mathematical-physical problem of real-height determination from ionograms.....  
 Electron density profiles, ionospheric, with continuous gradients and underlying ionization corrections, II. Formulation for a digital computer.....  
 Electron-density profiles, ionospheric, with continuous gradients and underlying ionization corrections: III. Practical procedures and some instructive examples.....  
 Electron density profiles, use of virtual height slopes for determination.....  
 ELF waves, emission of, in a lightning flash to earth, corona currents after the return stroke.....  
 ELF waves, note on the corona currents in a lightning discharge and the emission of.....  
*Emmons, C. B., B. R. Bean, R. W. Krinks*, Some spectral characteristics of the radio refractivity in the surface layer of the atmosphere.....  
 E-mode propagation, transient, in a plane-stratified plasma.....  
 Environment, jungle, radiation from dipoles in an idealized.....  
 Equatorial slot antenna, transmission and reception of an, on a re-entry sphere.....

Page  
191  
1031  
253

*Eteiza, A., D. H. Leibert*, Field theory of depolarization of radar backscatter—with application to a distant, slightly rough sphere.....  
 Estimation of the number of unresolvable targets producing a single radar return.....  
 Expansions, biorthogonal, for the linearized anisotropic multifluid warm plasma equations.....

Page  
979  
955  
927

**F**

*Fante, R. L.*, Effect of thin plasmas on an aperture antenna in an infinite conducting plane.....  
*Felsen, L. B., F. M. Labianca*, Radiation and scattering problems in compressible plasmas. I. Solutions by ray optics.....  
 —, —, Radiation and scattering problems in compressible plasmas, II. Solutions of boundary value problems.....  
 —, S. Rosenbaum, Ray optics for radiation problems in anisotropic regions with boundaries. I. Line source excitation.....  
 Field-strength measurements in a multipath field using linear and circular probing....  
 Field theory of depolarization of radar backscatter—with application to a distant, slightly rough sphere.....  
 Finite scattering matrix for an infinite antenna array.....  
 Five years of VLF worldwide comparison of atomic frequency standards.....  
 Fluctuations, strong, of refractive index, scattering of waves by a medium with.....  
 Formulation of the effective resistance.....  
 Fredholm integral equations of the first and second kind occurring in antenna theory, digital computer solutions of.....  
*Freidberg, J. P., R. Sasiela*, Utilization of the refractive index surfaces to evaluate Cerenkov radiation in an infinite magnetoplasma.....  
*Fremouw, E. J., J. M. Lansinger*, Interferometer phase and amplitude measurements for determining coherence ratio and wavefront correlation.....  
 Frequency dependence of VLF fading at sunrise.....  
 Frequency shifts on whistler mode signals from a stabilized VLF transmitter, antenna.....  
*Freyheit, P. J., C. D. Lustig, G. Meltz*, Admittance of a plasma-covered cylindrical antenna.....  
*Fujiooka, H., N. Kumagai*, Electromagnetic radiation in a moving lossy medium.....  
 Full wave solutions in terms of coupled vacuum modes.....  
*Fuchs, A. K.*, Comments on a paper "Electromagnetic Scattering From Rough Finitely Conducting Surfaces" by A. Stoyanov.....  
 Further note on the quasi-static theory of a cylindrical impedance probe for magnetoplasma.....

87  
29  
53  
769  
101  
979  
19  
627  
1  
1419  
1067  
703  
947  
547  
589  
209  
1449  
913  
1525  
253

**G**

*Galejs, J.*, Power flow from a short antenna in a lossy uniaxial medium.....  
 —, Propagation of VLF waves below anisotropic ionosphere models with a dipping static magnetic field.....  
 —, Propagation of VLF waves below an anisotropic stratified ionosphere with a transverse static magnetic field.....  
*Garnier, W. E., F. J. Rhoads*, An investigation of the modal interference of VLF radio waves.....  
 General integrals, Wait's, on the evaluation of.....  
 General scattering matrix equations for waveguide structures of varying surface impedance boundaries.....  
 General mode structure and resonant frequencies for ferrite-loaded circularly cylindrical cavity resonators.....  
 Geometric optics solution.....  
*Gibbs, B. W., K. A. Graf, M. P. Burchynski*, Reflection of circularly polarized electromagnetic waves from an anisotropic plasma.....  
*Goodrich, R. F., M. A. Plonus*, Scattering from resonant slots on a semi-infinite cone.....  
*Gossard, E. E., I. J. Rothmuller, R. A. Pappert*, Numerical investigations of classical approximations used in VLF propagation.....  
*Gothard, N.*, A note on the description of dipole fields.....  
*Goubau, G.*, Zenneck memorial lecture.....  
*Graf, K. A., M. P. Burchynski, B. W. Gibbs*, Reflection of circularly polarized electromagnetic waves from an anisotropic plasma.....  
 Graphical attenuation calculations for irregular terrain (digest).....  
*Gross, S. H.*, Propagation in nonuniform slightly gyroscopic media.....  
 Groundwave attenuation function for propagation over a highly inductive earth.....  
*Gupta, R. K.*, On the evaluation of Wait's general integrals.....

1419  
1497  
557  
539  
1521  
287  
681  
821  
881  
1437  
387  
1105  
513  
881  
1109  
893  
687  
1521

**H**

*Hagfors, T.*, A study of the depolarization of lunar radar echoes.....  
*Hannun, P. W.*, Proof that a phased array antenna can be impedance matched for all scan angles.....  
*Harrison, C. W. Jr.*, Response of transmission lines in proximity to a cylindrical scatterer.....  
 —, C. D. Taylor, Transmission and reception properties of an equatorial slot antenna on a re-entry sphere.....  
 —, E. E. O'Donnell, E. A. Aronson, On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory.....  
*Hartmann, R. F.*, Graphical attenuation calculations for irregular terrain (digest).....  
*Heading, J.*, Coupled equations for electroacoustic waves.....  
*Herbert, T.*, Tables of virtual heights for models of monotonic and nonmonotonic ionospheric layers.....  
 High-speed disturbances on VLF propagation, influence of.....  
*Hirsch, P.*, Transient E-mode propagation in a plane-stratified plasma.....  
*Hodges, R. Jr.*, Waves in a partially ionized paramagnetic gas.....  
*Hop, H.*, Direct use of the phase refractive index or reducing h'(f) curves to H(h) profiles.....

445  
361  
1083  
337  
1067  
1109  
1401  
167  
1269  
659  
407  
311  
1177

Holt, O., G. M. Lefeld, Results from an RF capacity probe experiment in the auroral ionosphere.....	Page 1283	
Howe, H. H., Ionospheric electron density profiles with continuous gradients and underlying ionization corrections. II. Formulation for a digital computer.....	1135	
Huang, C., A new method of obtaining an ionospheric index of solar activity from the F2 layer critical frequencies.....	467	
Hudson, A. C., A nomogram for atmospheric radio refraction.....	1113	
I		
Illinois 400-foot radio telescope: performance and electronic equipment.....	Page 147	
Illumination of an inhomogeneous spherical earth by an LF plane electromagnetic wave.....	111	
Impedance of a cylindrical dipole in a warm plasma, effects of induced acoustic sources on.....	1327	
Infinite antenna in an anisotropic plasma, problem of the.....	495	
Infinite cylindrical antenna, admittance dependence, upon exciting gap thickness.....	1431	
Infinite cylindrical dielectric-coated antenna.....	325	
Influence of high-latitude disturbances on VLF propagation.....	659	
Inhomogeneous spherical earth, illumination of, by an LF plane electromagnetic wave.....	111	
Integral equation approach to scattering from a body of finite conductivity.....	1459	
Integral representation of the fields and its asymptotic evaluation.....	793	
Integrals, general, on the evaluation of Wait's.....	1521	
Interferometer phase and amplitude measurements for determining coherence ratio and waveform correlation.....	947	
Investigation of the modal interference of VLF radio waves.....	539	
Ionogram reduction, ten-point method.....	1233	
Ionograms, overlapping-polynomial analysis of.....	1169	
Ionosphere, anisotropic stratified, propagation of VLF waves below, with a transverse static magnetic field.....	557	
Ionospheric, auroral, results from an RF capacity probe experiment.....	1283	
Ionospheric calculation of the virtual height and absorption of radio waves.....	133	
Ionospheric transmission of VLF radio waves through.....	595	
Ionospheric-electron-density profiles with continuous gradients and underlying ionization corrections: I. The mathematical-physical problem of real-height determination from ionograms.....	1127	
Ionospheric-electron-density profiles with continuous gradients and underlying ionization corrections. II. Formulation for a digital computer.....	1135	
Ionospheric-electron-density profiles with continuous gradients and underlying ionization corrections: III. Practical procedures and some instructive examples.....	1159	
Ionospheric index of solar activity, new method of obtaining, from the F2 layer critical frequencies.....	467	
Ionospheric layers, tables of virtual heights for models of monotonic and nonmonotonic.....	1269	
Ionospheric parameters, direct manual calculation of using a single-polynomial analysis.....	1237	
Ionospheric profiles, computation and application of synoptic.....	1255	
Ionospheric reflections, oblique incidence, of 100 kHz pulses.....	645	
Ionospheric wave theory using coupled vacuum modes.....	905	
J		
John Howard Dellinger memorial lecture.....	751	
Johnson, G. L., K. R. Cook, Problem of the infinite antenna in an anisotropic plasma.....	495	
Jones, T. B., B. Burgess, Solar flare effects and VLF radio wave observations of the lower ionosphere.....	619	
Jull, E. V., Aperture fields in an anisotropic medium.....	837	
K		
Kalluri, D., B. R. Chawla, H. Unz, Propagation of oblique electromagnetic waves through a warm plasma slab with normal magnetostatic field.....	869	
Kestner, O. B., G. A. Deschamps, Radiation of an antenna in a compressible magnetoplasma.....	757	
King, R. J., G. A. Schlab, Groundwave attenuation function for propagation over a highly inductive earth.....	1303	
King, R. W., P. H., M. Cheung, Arrays of unequal and unequally spaced dipoles.....	1315	
—, T. T. Wu, Log-periodic dipole antennae.....	1061	
—, T. T. Wu, Thick tubular transmitting antenna.....	299	
Kornhauser, E. T., A. D. Yaghjian, Modal solution of a point source in a strongly focusing medium.....	1347	
Kouyoumjian, R. G., L. Peters, Jr., R. H. Ott, Scattering by a two-dimensional periodic array of narrow plates.....	503	
Krinks, R. W., B. R. Bein, C. B. Emmanuel, Some spectral characteristics of the radio refractivity in the surface layer of the atmosphere.....	991	
Kritikos, H. N., K. S. H. Lee, C. H. Papas, Electromagnetic reflectivity of nonuniform jet streams.....	73	
Kuehl, H. H., Computations of the resistance of a short antenna in a warm plasma.....	1449	
Kumagai, N., H. Fujioka, Electromagnetic radiation in a moving lossy medium.....	29	
L		
Lahianou, F. M., I. B. Felsen, Radiation and scattering problems in compressible plasmas, I. Solutions by ray optics.....	53	
—, —, Radiation and scattering problems in compressible plasmas, II. Solutions of boundary value problems.....	1255	
Laird, A. R., J. W. Wright, Computation and application of synoptic profiles.....	947	
Lansinger, J. M., E. J. Fremouw, Interferometer phase and amplitude measurements for determining coherence ratio and waveform correlation.....	503	
Larionov, D. B., J. R. Wait, Resonances of the thin-shell model of the earth-ionosphere cavity with a dipolar magnetic field.....	Large, D. B., J. R. Wait, Resonances of the thin-shell model of the earth-ionosphere cavity with a dipolar magnetic field.....	659
Larsen, T., S. Christiansen, Numerical application of the compensation theorem to mixed-path propagation problems.....	1471	
Lee, K. S. H., H. N. Kritikos, C. H. Papas, Electromagnetic reflectivity of nonuniform jet streams.....	991	
Lee, S. W., C. Liang, Y. T. Lo, On the coupling of modal waves in a plasma-filled parallel-plate waveguide.....	401	
—, —, Transient radiation of an electric dipole in a uniaxially anisotropic plasma.....	937	
Lenhert, D. H., A. Erteza, Field theory of depolarization of radar backscatter—with application to a distant, slightly rough sphere.....	813	
Lefeld, G. M., O. Holt, Results from an RF capacity probe experiment in the auroral ionosphere.....	1283	
LF plane electromagnetic wave, illumination of an inhomogeneous spherical earth by.....	111	
Liang, C., Y. T. Lo, S. W. Lee, On the coupling of modal waves in a plasma-filled parallel-plate waveguide.....	1481	
—, —, Scattering by two spheres.....	241	
Lightning flash to earth, corona currents after the return stroke and the emission of ELF waves in.....	101	
Linear and circular probing, a multipath field-strength measurements in.....	241	
Linearized anisotropic multifield warm plasma equations, biorthogonal expansions for.....	101	
Liu, C. H., Wave propagation in a random medium with parabolic background.....	927	
Lo, Y. T., S. W. Lee, C. Liang, On the coupling of modal waves in a plasma-filled parallel-plate waveguide.....	961	
—, C. Liang, Scattering by two spheres.....	401	
Log-periodic dipole antenna.....	1481	
Lunar radar echoes, a study of the depolarization of.....	1315	
Lustig, C. D., G. Meltz, P. J. Freyheit, Admittance of a plasma-covered cylindrical antenna.....	445	
Lynn, K. J. W., Anomalous sunrise effects observed on a long transequatorial VLF propagation path.....	203	
M	521	
Moffett, A. L., T. B. Curtz, Moment synthesis of array factors with nonuniform spacing and amplitude parameters.....	721	
Magnetic field, transverse static, propagation of VLF waves below an anisotropic stratified ionosphere.....	557	
Magnetoplasma, further note on the quasi-static theory of a cylinder impedance probe for.....	253	
Magnetoplasma, thermal radiation fields and antenna parameters.....	225	
Manual calculations of ionospheric parameters, direct, using a single-polynomial analysis.....	1237	
Matrix equations for waveguide structures, generalized scattering, varying surface impedance boundaries.....	287	
Matrix, finite scattering, for an infinite antenna array.....	287	
Maxwell, Eugene L., Atmospheric noise from 20 Hz to 30 Hz.....	19	
Mayhun, R. J., F. V. Schultz, Electromagnetic plane wave scattering from a plasma-coated conducting cylinder.....	637	
McNeill, F. A., Frequency shifts on whistler mode signals from a stabilized VLF transmitter.....	961	
Measured amplitude variations of the 19.8 kHz of NPM near its antipode.....	853	
Measurements, field-strength, in a multipath field using linear and circular probing.....	589	
Meltz, G., P. J. Freyheit, C. D. Lustig, Admittance of a plasma-coated cylindrical antenna.....	669	
Memorial lecture, Zenneck.....	101	
Microwave diffraction fading, determination of antenna height for protection against.....	203	
Millar, R. F., Propagation of electromagnetic waves near a coastline on a flat earth.....	513	
Miller, E. K., Admittance dependence of the infinite cylindrical antenna upon exciting gap thickness.....	163	
—, Electromagnetic wave scattering from a cylinder immersed in a warm plasma.....	261	
Millimeter wavelengths, atmospheric attenuation at.....	1431	
Mitter, R., J. Carlin, Effects of induced sources on the impedance of a cylindrical dipole in a warm plasma.....	319	
—, S. W. Lee, Mode-matching method for anisotropic guides.....	1327	
—, Transient radiation of an electric dipole in a uniaxially anisotropic plasma.....	937	
—, C. O. Stearns, Field-strength measurements in a multipath field using linear and circular probing.....	813	
Mitzner, K. M., An integral equation approach to scattering from a body of finite conductors.....	101	
Mixed-path propagation problems, numerical application of the compensation theorem.....	1459	
Modal solution of a point source in a strongly focusing medium.....	1471	
Modal waves, on the coupling of, in a plasma-filled parallel-plate waveguide.....	299	
Mode-matching method for anisotropic guides.....	401	
Modes, vacuum, ionospheric wave theory using coupled.....	905	
Moller, H. G., Oblique sweep-frequency experiments over a 2,000-km north-south subauroral path.....	77	
Moment synthesis of array factors with nonuniform spacing and amplitude parameters.....	721	
Morgan, A. H., B. E. Blair, E. L. Crow, Five years of VLF worldwide comparison of atomic frequency standards.....	627	
Morgan, M. G., John Howard Dellinger memorial lecture.....	751	
Moving media, electrodynamics of, present views.....	245	
Multiple scattering in a random continuum.....	1379	
N		
Naustrik, E., A. Egeland, The influence of high-latitude disturbances on VLF propagation.....	659	
New method of obtaining an ionospheric index of solar activity from the F2 layer critical frequencies.....	467	

Page	Page		
Noise, atmospheric, from 20 Hz to 30 kHz.....	637	Propagation of VLF waves below an anisotropic stratified ionosphere with a transverse static magnetic field.....	557
Nomenclature for oblique ionospheric soundings and ray tracing.....	1395		
Normal mode expansions.....	1113		
Note on the corona currents in a lightning discharge and the emission of ELF waves.....	937		
Note on the description of dipole fields.....	1394		
Note on the potential of a vertical electric dipole over the interface between two lossy media.....	1105		
Note on the reflection coefficient of a sharply bounded ionosphere for VLF signals at the magnetic equator.....	511	Quasi-static fields of dipole antennas located above the earth's surface.....	1093
Note on the tabular presentation of the radio refractive index as a function of meteorological parameters.....	653	Quasi-static theory, further note on, of a cylindrical impedance probe for magnetoplasma.....	253
NPM field near its antipode, measured amplitude variations of the 19.8 kHz.....	1523	Quick model method for obtaining real-height parameters from routine ionospheric data.....	1263
Numerical application of the compensation theorem to mixed-path propagation problems.....	669		
Numerical investigation of classical approximations used in VLF propagation.....	1471		
	387	<b>R</b>	
Oblique incidence ionospheric reflections of 100 kHz pulses.....	645	Radar backscatter — with application to a distant, slightly rough sphere, field theory of depolarization.....	979
Oblique ionospheric soundings and ray tracing, a nomenclature for.....	1395	Radar echoes, lunar, a study of the depolarization.....	445
Oblique sweep-frequency experiments over a 2,000-km north-south subauroral path.....	77	Radar return, single, estimation of the number of unresolvable targets producing radiation and scattering problems in compressible plasmas, I, solutions by ray optics.....	955
O'Donnell, E. E., E. A. Aronson, C. W. Harrison, Jr., C. D. Taylor, On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory.....	1067		29
On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory.....	1471	Radar and scattering problems in compressible plasmas, II, solutions of boundary value problems.....	53
On Rylov's method.....	351	Radiation, electromagnetic, in a moving lossy medium.....	1449
On the calculation of antenna patterns for an inhomogeneous spherical earth.....	1205	Radiation fields, thermal, and antenna parameters in magnetoplasma.....	225
On the coupling of modal waves in a plasma-filled parallel-plate waveguide.....	1521	Radiation from dipoles in an idealized jungle environment.....	747
On the exact theory of a prolate spheroidal receiving and scattering antenna.....	1067	Radiation of an antenna in a compressible magnetoplasma.....	757
On the manual and digital computer methods used at Lindau for the conversion of multifrequency ionograms to electron density-height profiles.....	1361	Radiation, transient, of an electric dipole in a uniaxially anisotropic plasma.....	813
On the evaluation of Wait's general integrals.....	401	Radio refraction, atmospheric, a nomogram for.....	1113
On the theory of radiation from a raised electric dipole over an inhomogeneous ground plane.....	351	Radio refractivity in surface layer of atmosphere, some spectral characteristics of the.....	503
Ott, R. H., R. G. Kouyoumjian, L. Peters, Jr., Scattering by a two-dimensional periodic array of narrow plates.....	1347	Radio telescope, 400-foot, Illinois; performance and electronic equipment.....	147
Ott, R. H., The admittance of cylindrical antennas driven from a coaxial line.....	1029	Radio waves in the ionosphere, calculation of the virtual heights and absorption of.....	133
Overlapping-polynomial analysis of ionograms.....	1169	Radio wave observations of the lower ionosphere, solar flare effects.....	619
		Radio waves, VLF, diurnal changes of phase and group velocity.....	119
		Radio waves, VLF, investigation of modal interference.....	539
		Radio waves, VLF, transmission of, through the ionosphere.....	595
		Random medium, one-dimensional, wave propagation in.....	429
		Random medium, wave propagation in, with parabolic background.....	961
		Rao, M., Corona currents after the return stroke and the emission of ELF waves in a lightning flash to earth.....	241
		—, Note on the corona currents in a lightning discharge and the emission of ELF waves.....	1394
		Rapid and accurate ray tracing algorithm for a horizontally stratified atmosphere.....	249
Papert, R. A., E. E. Gossard, L. J. Rothmuller, Numerical investigation of classical approximations used in VLF propagation.....	991	Rawles, A. T., B. Burgess, Results of the two-frequency VLF transmission experiments from Criggion GBZ.....	1295
Parabolic background, wave propagation in a random medium.....	387	Ray interpretation for the stationary point contributions.....	793
Parallel-plate waveguide, plasma-filled, on the coupling of modal waves.....	961	Ray optics for radiation problems.....	793
Parameters, real-height, quick model method for obtaining from routine ionospheric date.....	401	Ray optics for radiation problems in anisotropic regions with boundaries, I, Line source excitation.....	769
Paramagnetic gas, waves in a partially ionized.....	311	Ray optics for radiation problems in anisotropic regions with boundaries, II, Point source excitation.....	793
Paul, A. K., Ionospheric electron-density profile with continuous gradients and underlying ionization corrections, I. The mathematical-physical problem of real height determination from ionograms.....	1123	Ray optics, solutions by; radiation and scattering problems in compressible plasmas, I.....	29
—, Use of virtual-height slopes for determination of electron-density profiles.....	1195	Ray-optical solution for the fields scattered from a curved interface.....	793
Periodic, two-dimensional array of narrow plates, scattering by.....	1347	Ray tracing algorithm, rapid and accurate for a horizontally stratified atmosphere.....	249
Peters, L., Jr., R. H. Ott, R. G. Kouyoumjian, Scattering by a two-dimensional periodic array of narrow plates.....	1029	Ray tracing, a nomenclature for oblique ionospheric soundings.....	1395
Phase and group velocity of VLF radio waves, diurnal changes.....	1347	Real-height parameters, quick model method for obtaining, from routine ionospheric data.....	1263
Phase measurements of VLF transmissions over an 11,000-km transequatorial path.....	1195	Reentry sphere, transmission and reception properties of an equatorial slot antenna on a.....	337
Phased array antenna can be impedance matched, proof that a, for all scan angles.....	1347	Reflection of circularly polarized electromagnetic waves from an anisotropic plasma.....	881
Phase refractive index, direct use of, for reducing $h'(f)$ curves to $N(h)$ profiles.....	373	Reflections, oblique incidence ionospheric, of 100 kHz pulses.....	645
Plasma, anisotropic, reflection of circularly polarized electromagnetic waves from.....	361	Reflection transmissions and absorption coefficients.....	869
Plasma-coated conducting cylinder, electromagnetic plane wave scattering from.....	1177	Reflectivity, electromagnetic, nonuniform jet streams.....	991
Plasma, compressible, dispersion relation.....	881	Refractive index, phase, direct use of, for reducing $h'(f)$ curves to $N(h)$ profiles.....	1177
Plasma-covered cylindrical antenna, admittance of.....	881	Refractive index, scattering of waves by a medium with strong fluctuations.....	I
Plasma-filled parallel-plate waveguide, on the coupling of modal waves.....	1019	Refractive index, note on the tabular presentation of the radio, as a function of meteorological parameters.....	1523
Plasma, transient E-mode propagation in a plane-stratified.....	203	Refractive index surfaces, utilization of, to evaluate Cerenkov radiation in an infinite magnetoplasma.....	703
Plasma, warm, computations of the resistance of a short antenna in.....	401	Reply to A. K. Fung's comments.....	1526
Plasmas, thin, effect of, on an aperture antenna in an infinite conducting plane.....	407	Resonances of the thin-shell model of the earth-ionosphere cavity with a dipolar magnetic field.....	695
Plonus, M. A., R. F. Goodrich, Scattering from resonant slots on a semi-infinite cone.....	73	Resonant frequencies for ferrite-loaded circularly cylindrical cavity resonators, general mode structure.....	695
Poeverlein, H., Ionospheric wave theory using coupled vacuum modes.....	87	Resonators, general mode structure and resonant frequencies for ferrite-loaded circularly cylindrical cavity.....	681
Point source, modal solution of a, in a strongly focusing medium.....	1437	Resonant slots, scattering from, on a semi-infinite cone.....	681
Polarized electromagnetic waves, reflection of circularly, from an anisotropic plasma.....	1419	Response of transmission lines in proximity to a cylindrical scatter.....	1437
Power flow from a short antenna in a lossy uniaxial medium.....	245	Results concerning the sunrise effect of VLF signals propagated over long paths.....	1083
Present views on electrodynamics of moving media.....	607	Results from an RF capacity probe experiment in the auroral ionosphere.....	1283
Price, Guy H., Propagation of electromagnetic waves into anisotropic media from an external point-dipole source.....	495	Results of the two-frequency VLF transmission experiments from Criggion GBZ.....	1283
Problem of the infinite antenna in an anisotropic plasma.....	1119	Review of current methods for obtaining electron profiles from ionograms.....	1119
Profiles, electron, a review of current methods for obtaining from ionograms.....	351	RF admittance measurements of a slotted-sphere antenna immersed in a plasma.....	489
Prolate spheroidal receiving and scattering antenna, on the exact theory.....	351	RF capacity probe, results from, experiment in the auroral ionosphere.....	1283
Propagation of oblique electromagnetic waves through a warm plasma slab with normal magnetostatic field.....	869	Rhoads, F. J., W. E. Garner, An investigation of the modal interference of VLF radio waves.....	539
Propagation, wave, in a random medium with parabolic background.....	961	Ries, G., Diurnal phase change of VLF signals propagated over long paths.....	379
Proof that a phased array antenna can be impedance matched for all scan angles.....	361	—, Results concerning the sunrise effect of VLF signals propagated over long paths.....	531
Propagation in nonuniform slightly gyrotropic media.....	893	Rogerson, J. E., Airborne field strength measurements in the region of the NPM antipode.....	581
Propagation of electromagnetic waves near a coastline on a flat earth.....	261	Rosenbaum, S., Leopold B. Felsen, Ray optics for radiation problems in anisotropic regions with boundaries, I, Line source excitation.....	769
Propagation of electromagnetic waves into anisotropic media from an external point-dipole source.....	607	Rothmuller, L. J. R., A. Pappert, E. A. Gossard, Numerical investigation of classical approximations used in VLF propagation.....	387
Propagation of VLF waves below anisotropic ionosphere models with a dipping static magnetic field.....	1497		

Page	Page		
Rugg, D. E., Theoretical investigation of the diurnal phase and amplitude variations of VLF signals.....	551	Thin-shell model of the earth-ionosphere cavity, resonances of, with a dipolar magnetic field.....	695
Rylov's method.....	437	Ting, C. Y., Infinite cylindrical dielectric-coated antenna.....	325
<b>S</b>		Tironi, G., P. Bassanini, C. Cercignani, F. Sernagiotto, Scattering of waves by a medium with strong fluctuations of refractive index.....	1
Sancer, M. I., Biorthogonal expansions for the linearized anisotropic multifluid warm plasma equations.....		Titheridge, J. E., Calculation of the virtual height and absorption of radio waves in the ionosphere.....	133
Sasiela, R., J. P. Freidberg, Utilization of the refractive index surfaces to evaluate Čerenkov radiation in an infinite magnetoplasma.....		Titheridge, J. E., Direct manual calculations of ionospheric parameters using a single-polynomial analysis.....	1237
Scaling for rotationally symmetric potential in uniaxial media.....	927	Titheridge, J. E., The overlapping-polynomial analysis of ionograms.....	1169
Scarabucci, R., R. F. de Mendonça, Phase measurements of VLF transmissions over an 11,000-km transequatorial path.....	703	Transequatorial VLF propagation path, anomalous sunrise effects observed.....	521
Scatterer, cylindrical, response of transmission lines in proximity to a.....	833	Transient E-mode propagation in a plane-stratified plasma.....	407
Scattering by a two-dimensional periodic array of narrow plates.....	1083	Transient radiation of an electric dipole in a uniaxially anisotropic plasma.....	813
Scattering by two spheres.....	1347	Transient TEM wave propagation in unbounded radial line.....	1517
Scattering, electromagnetic, by thin inhomogeneous circular cylinders.....	1481	Transmission and reception properties of an equatorial slot antenna on a reentry sphere.....	1237
Scattering, electromagnetic from rough finitely conducting surfaces.....	729	Transmission of VLF radio waves through the ionosphere.....	337
Scattering from a body of finite conductivity, an integral equation approach.....	415	Transmissions, VLF, phase measurements, over an 11,000-km transequatorial path.....	373
Scattering from resonant slots on a semi-infinite cone.....	1459	Traveling waves in relation to the surface fields on a semi-infinite cone.....	479
Scattering matrix, finite, for an infinite antenna array.....	1437	Two-dimensional periodic array of narrow plates, scattering by.....	1347
Scattering, multiple, in a random continuum.....	19	Tyras, G., P. C. Caucavas, Note on the potential of a vertical electric dipole over the interface between two lossy media.....	511
Scattering of waves by a medium with strong fluctuations of refractive index.....		<b>U</b>	
Schlak, Gerard A., R. J. King, Groundwave attenuation function for propagation over a highly inductive earth.....	687	Unz, H., J. K. Butler, Beam efficiency and gain optimization of antenna arrays with nonuniform spacings.....	711
Schmerling, E. K., Ten-point method of ionogram reduction.....	1233	-, B. R. Chaudhuri, D. Kalluri, Propagation of oblique electromagnetic waves through a warm plasma slab with normal magnetostatic field.....	869
Schultz, F. V., R. J. Mayhan, Electromagnetic plane wave scattering from a plasma-coated conducting cylinder.....	853	Use of virtual height slopes for determination of electron-density profiles.....	1195
Senior, T. B. A., J. J. Bouman, Diffraction of a dipole field by a perfectly conducting half-plane.....	1339	Utilization of the refractive index surfaces to evaluate Čerenkov radiation in an infinite magnetoplasma.....	703
-, P. H. Wilcox, Traveling waves in relation to the surface fields on a semi-infinite cone.....	479	<b>V</b>	
Sernagiotto, F., G. Tironi, P. Bassanini, C. Cercignani, Scattering of waves by a medium with strong fluctuations of refractive index.....	1	Vacuum modes, full-wave solutions of coupled.....	913
Shen, L.-C., T. T. Wu, The cylindrical antenna with tapered resistive loading.....	191	Vacuum modes, ionospheric wave theory using coupled.....	905
Shmyars, J., H. J. Stalzer, Jr., Diffraction by a cylinder in a locally uniaxial medium with azimuthal optic axis.....	821	Virtual heights, tables of, for models of monotonic and nonmonotonic ionospheric layers.....	1269
Signals, theoretical investigation of the diurnal phase and amplitude variations of VLF.....	1437	VLF attenuation rates deduced from aircraft observations near the antipode of NPM.....	575
Slots, resonant, scattering from, on a semi-infinite cone.....	489	VLF fading at sunrise, frequency dependence of.....	547
Slotted-sphere antenna measurements, RF admittance, immersed in a plasma.....	1119	VLF propagation, influence of high latitude disturbances on.....	659
Smith, G. H., J. W. Wright, Review of current methods for obtaining electron profiles from ionograms.....	669	VLF propagation, numerical investigation of classical approximations used in.....	387
Snyder, F. P., J. E. Bickel, Measured amplitude variations of the 19.8 kHz field of NPM near its antipode.....	619	VLF radio wave observations of the lower ionosphere, solar flare effects.....	619
Solar activity index, new method of obtaining an ionospheric, from the F2 layer critical frequencies.....	503	VLF radio waves, diurnal changes of phase and group velocity of.....	119
Solar flare effects and VLF radio wave observations of the lower ionosphere.....	1481	VLF radio waves, investigation of modal interference.....	539
Some spectral characteristics of the radio refractivity in the surface layer of the atmosphere.....	1513	VLF radio waves, transmission of, through the ionosphere.....	595
Spheres, two, scattering by.....	1361	VLF signals at the magnetic equator, a note on the reflection coefficient of a sharply bounded ionosphere for.....	653
Spherical wave propagation through a random continuum.....	821	VLF signals, diurnal phase change of, propagated over long paths.....	379
Spies, K. P., J. R. Wait, On the calculation of antenna patterns for an inhomogeneous spherical earth.....	101	VLF signals, propagated over long paths, results concerning the sunrise effect of.....	531
Stalzer, H. J., Jr., J. Shmyars, Diffraction by a cylinder in a locally uniaxial medium with azimuthal optic axis.....	547	VLF signals, theoretical investigation of the diurnal phase and amplitude variations of.....	551
Stearns, C. O., R. Mittra, Field-strength measurements in a multipath field using linear and circular probing.....	415	VLF transmission experiments from Criegion GBZ, results of the two-frequency.....	1295
Steene, F. K., D. D. Crombie, Frequency dependence of VLF fading at sunrise.....	1526	VLF transmission loss through spectral analyses of atmospheres.....	139
Stogryn, A., Electromagnetic scattering from rough, finitely conducting surfaces - Reply to A. K. Fung's comments.....	445	VLF transmissions, phase measurements of, over an 11,000-km transequatorial path.....	373
Study of the depolarization of lunar radar echoes.....	77	VLF waves below anisotropic ionosphere.....	1497
Subauroral path, 2000-km north-south, oblique sweep-frequency experiments over.....	521	VLF waves propagation of, below an anisotropic stratified ionosphere with a transverse static magnetic field.....	557
Sunrise effects, anomalous, observed on a long transequatorial VLF propagation path.....	531	VLF worldwide comparison of atomic frequency standards, five years of.....	627
Sunrise effect of VLF signals, results concerning, propagated over long paths.....	479	<b>W</b>	
Surface fields on a semi-infinite cone, traveling waves in relation to.....	77	Walitz, J. R., Comments on a paper "A numerical investigation of classical approximations used in VLF propagation" by R. A. Pappert, E. E. Gossard, and I. J. Rothmüller.....	1393
Sweep-frequency experiments, oblique, over a 2000-km north-south subauroral path.....	147	-, Electromagnetic whispering gallery modes in a dielectric rod.....	1005
Swenson, G. W., Jr., K. S. Yang, The Illinois 400-foot radio telescope; performance and electronic equipment.....	1269	-, Further note on the quasi-static theory of a cylindrical impedance probe for magnetoplasma.....	253
<b>T</b>		-, Illumination of an inhomogeneous spherical earth by an LF plane electromagnetic wave.....	111
Tables of virtual heights for models of monotonic and nonmonotonic ionospheric layers.....	245	-, On the theory of radiation from a raised electric dipole over an inhomogeneous ground plane.....	997
Tai, C. T., Present views on electrodynamics of moving media.....	1263	-, Radiation from dipoles in an idealized jungle environment.....	747
Taikeb, C., A quick model method for obtaining real-height parameters from routine ionospheric data.....	351	-, D. B. Large, Resonances of the thin-shell model of the earth-ionosphere cavity with a dipolar magnetic field.....	695
Taylor, C. D., Electromagnetic scattering by thin inhomogeneous circular cylinders - Or the exact theory of a prolate spheroidal receiving and scattering antenna.....	337	-, K. P. Spies, On the calculation of antenna patterns for an inhomogeneous spherical earth.....	1361
-, C. W. Harrison, Jr., Transmission and reception properties of an equatorial slot antenna on a reentry sphere.....	1067	Walsetzko, J. A., G. Beketh, RF admittance measurements of a slotted-sphere antenna immersed in a plasma.....	489
-, E. E. O'Donnell, E. A. Aronson, C. W. Harrison, Jr., On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory.....	437	Walsh, D., H. Weil, Thermal radiation fields and antenna parameters in magnetoplasma.....	225
Taylor, L. S., On Rylov's method.....	139	Walsh, Edward J., Full-wave solutions in terms of coupled vacuum modes.....	913
Taylor, W. L., VLF transmission loss through special analyses of atmospheres.....	1233	Warm plasma, computations of the resistance of a short antenna.....	73
Tem-point method of ionogram reduction.....	249	Warm plasma, effects of induced acoustic sources on the impedance of a cylindrical dipole.....	1327
Thaver, G. D., Rapid and accurate ray tracing algorithm for a horizontally stratified atmosphere.....	167	Warm plasma equations, linearized anisotropic multifluid, biorthogonal expansions for.....	927
Theoretical investigation of the diurnal phase and amplitude variations of VLF signals.....	167	Waveguide structures of varying surface impedance boundaries, generalized scattering matrix equations.....	287
Theory of the balanced helical wire antenna.....	225	Wavelengths, atmospheric attenuation at millimeter.....	319
Thermal radiation fields and antenna parameters in magnetoplasma.....	1061	Wave propagation in a one-dimensional random medium.....	429
Thick tubular transmitting antenna.....		Wave propagation in a random medium with parabolic background.....	961

Page	Page
Wave propagation, spherical, through a random continuum.....	1513
Wave propagation, transient TEM, in unbounded radial line.....	1517
Wave scattering, electromagnetic, from a cylinder immersed in a warm plasma.....	1411
Waves in a partially ionized paramagnetic gas.....	311
Waves, propagation of electromagnetic, near a coastline on a flat earth.....	261
Waves, scattering of, by a medium with strong fluctuations of refractive index.....	1
Wave theory, ionospheric, using coupled vacuum modes.....	905
Well, H., D. Walsh, Thermal radiation fields and antenna parameters in magnetoplasma.....	225
Werner, M. M., Transient TEM wave propagation in unbounded radial line.....	1517
Westfall, W. D., Diurnal changes of phase and group velocity of VLF radio waves.....	119
Whispering gallery modes in a dielectric rod.....	1005
Whistler mode signals, frequency shifts on, from a stabilized VLF transmitter.....	589
Wilson, B., Transmission of VLF radio waves through the ionosphere.....	595
Wilson, P. H., T. B. A. Senior, Traveling waves in relation to the surface fields on a semi-infinite cone.....	479
Wilkerson, R. E., H. T. Dougherty, Determination of antenna height for protection against microwave diffraction fading.....	161
Wright, J. W., Ionospheric electron-density profiles with continuous gradients and underlying ionization corrections: III. Practical procedures and some instructive examples.....	1159
Wright, J. W., A. R. Laird, Computation and application of synoptic ionospheric profiles.....	1255
Wright, J. W., G. H. Smith, A review of current methods for obtaining electron profiles from ionograms.....	1119
Wu, Tai Tsun, Ronald W. P. King, Thick tubular transmitting antenna.....	1061
Wu, T. T., L.-C. Shen, The cylindrical antenna with tapered resistive loading.....	191
Wu, Yung-Kuang, Dispersion relation in compressible plasma.....	1019
Wulfberg, K. N., Atmospheric attenuation at millimeter wavelengths.....	319
<b>Y</b>	
Yaghjian, A. D., E. T. Kornhauser, Modal solution of a point source in a strongly focusing medium.....	299
Yang, K. S., G. W. Steenson, Jr., The Illinois 400-foot radio telescope; performance and electronic equipment.....	147
<b>Z</b>	
Zenneck memorial lecture.....	513

# Radio Science

Published by

U.S. DEPARTMENT OF COMMERCE

Environmental Science Services Administration

in cooperation with

U.S. NATIONAL COMMITTEE of the

INTERNATIONAL SCIENTIFIC RADIO UNION



Volume 2 (New Series)—January through December 1967

Papers 2-1-174 through 2-12-321

---

For sale by the Superintendent of Documents, U.S. Government Printing Office  
Washington, D.C. 20402

Library of Congress Catalog Number: 66-60016

## Contents of Volume 2

### Volume 2 (New Series), No. 1, January 1967

	Page
Scattering of waves by a medium with strong fluctuations of refractive index. Piero Bassanini, Carlo Cercignani, Franco Sergnagiotto, and Gino Tironi.....	1
Finite scattering matrix for an infinite antenna array. E. C. DuFort.....	19
Radiation and scattering problems in compressible plasmas. Part I. Solutions by ray optics. Leopold B. Felsen and F. M. Labianca.....	29
Radiation and scattering problems in compressible plasmas. Part II. Solutions of boundary-value problems. F. M. Labianca and Leopold B. Felsen.....	53
Computations of the resistance of a short antenna in a warm plasma. H. H. Kuehl.....	73
Oblique sweep-frequency experiments over a 2000-km north-south subauroral path. Hans G. Möller.....	77
Effect of thin plasmas on an aperture antenna in an infinite conducting plane. R. L. Fante.....	87
Field-strength measurements in a multipath field using linear and circular probing. R. Mittra and C. O. Stearns.....	101
Illumination of an inhomogeneous spherical earth by an LF plane electromagnetic wave. James R. Wait.....	111
Diurnal changes of phase and group velocity of VLF radio waves. W. D. Westfall.....	119

### Volume 2 (New Series), No. 2, February 1967

	Page
Calculation of the virtual height and absorption of radio waves in the ionosphere. J. E. Titheridge.....	133
VLF transmission loss calculated from spectral analyses of atmospherics. W. L. Taylor.....	139
The Illinois 400-foot radio telescope; performance and electronic equipment. K. S. Yang and G. W. Swenson, Jr.....	147
Determination of antenna height for protection against microwave diffraction fading. Harold T. Dougherty and Robert E. Wilkerson.....	161
Theory of the balanced helical wire antenna. Chin-Lin Chen.....	167
Cylindrical antenna with tapered resistive loading. Liang-Chi Shen and Tai Tsun Wu.....	191
Admittance of a plasma-covered cylindrical antenna. G. Meltz, P. J. Freyheit, and C. D. Lustig.....	203
Thermal radiation fields and antenna parameters in magnetoplasma. Herschel Weil and D. Walsh.....	225
Corona currents after the return stroke and the emission of ELF waves in a lightning flash to earth. Manoranjan Rao.....	241
Present views on electrodynamics of moving media. C. T. Tai.....	245
A rapid and accurate ray tracing algorithm for a horizontally stratified atmosphere. G. D. Thayer.....	249
Further note on the quasi-static theory of a cylindrical impedance probe for magnetoplasma. James R. Wait.....	253

Volume 2 (New Series), No. 3, March 1967

	Page
Propagation of electromagnetic waves near a coastline on a flat earth. R. F. Millar.....	261
Generalized scattering matrix equations for waveguide structures of varying surface impedance boundaries. E. Bahar.....	287
Modal solution of a point source in a strongly focusing medium. E. T. Kornhauser and A. D. Yaghjian.....	299
Waves in a partially ionized paramagnetic gas. R. R. Hodges, Jr.....	311
Atmospheric attenuation at millimeter wavelengths. Karl N. Wulfsberg.....	319
Infinite cylindrical dielectric-coated antenna. Chung-Yu Ting.....	325
Transmission and reception properties of an equatorial slot antenna on a reentry sphere. Charles W. Harrison, Jr. and Clayborne D. Taylor.....	337
On the exact theory of a prolate spheroidal receiving and scattering antenna. Clayborne D. Taylor.....	351
Proof that a phased-array antenna can be impedance matched for all scan angles. Peter W. Hannan.....	361

Volume 2 (New Series), No. 4, April 1967

	Page
Phase measurements of VLF transmission over an 11,000-km trans-equatorial path. R. R. Scarabucci and F. de Mendonça.....	373
Diurnal phase change of VLF signals propagated over long paths. G. Ries....	379
A numerical investigation of classical approximations used in VLF propagation. Richard A. Pappert, Earl E. Gossard, and Ilan J. Rothmuller.....	387
On the coupling of modal waves in a plasma-filled parallel-plate waveguide. S. W. Lee, C. Liang, and Y. T. Lo.....	401
Transient E-mode propagation in a plane-stratified plasma. Peter Hirsch...	407
Electromagnetic scattering from rough, finitely conducting surfaces. Alex Stogryn.....	415
Wave propagation in a one-dimensional random medium. Piero Bassanini...	429
On Rytov's method. Leonard S. Taylor.....	437

Volume 2 (New Series), No. 5, May 1967

	Page
A study of the depolarization of lunar radar echoes. Tor Hagfors.....	445
A new method of obtaining an ionospheric index of solar activity from the F2 layer critical frequencies. Chun-ming Huang.....	467
Traveling waves in relation to the surface fields on a semi-infinite cone. T. B. A. Senior and P. H. Wilcox.....	479
RF admittance measurements of a slotted-sphere antenna immersed in a plasma. J. A. Waletzko and G. Beketi.....	489
On the problem of the infinite antenna in an anisotropic plasma. K. R. Cook and G. L. Johnson.....	495
Some spectral characteristics of the radio refractivity in the surface layer of the atmosphere. B. R. Bean, C. B. Emmanuel, and R. W. Krinks.....	503
A note on the potential of a vertical electric dipole over the interface between two lossy media. P. C. Cacavas and G. Tyras.....	511
Zenneck memorial lecture. Georg Goubau.....	513

	Page
Preface to "Propagation of Long Radio Waves" papers. D. D. Crombie...	i
Anomalous sunrise effects observed on a long transequatorial VLF propagation path. K. J. W. Lynn.....	521
Results concerning the sunrise effect of VLF signals propagated over long paths. G. Ries.....	531
An investigation of the modal interference of VLF radio waves. F. J. Rhoads and W. E. Garner.....	539
Frequency dependence of VLF fading at sunrise. F. K. Steele and D. D. Crombie.....	547
Theoretical investigation of the diurnal phase and amplitude variations of VLF signals. Donald E. Rugg.....	551
Propagation of VLF waves below an anisotropic stratified ionosphere with a transverse static magnetic field. Janis Galejs.....	557
VLF attenuation rates deduced from aircraft observations near the antipode of NPM. John E. Bickel.....	575
Airborne field strength measurements in the region of the NPM antipode. J. E. Rogerson.....	581
Frequency shifts on whistler mode signals from a stabilized VLF transmitter. F. A. McNeill.....	589
Transmission of VLF radio waves through the ionosphere. Bernard Wieder...	595
Propagation of electromagnetic waves into anisotropic media from an external point-dipole source. Gary H. Price.....	607
Solar flare effects and VLF radio wave observations of the lower ionosphere. B. Burgess and T. B. Jones.....	619
Five years of VLF worldwide comparison of atomic frequency standards. B. E. Blair, E. L. Crow, and A. H. Morgan.....	627
Atmospheric noise from 20 Hz to 30 kHz. Eugene L. Maxwell.....	637
Oblique incidence ionospheric reflections of 100 kHz pulses. Robert H. Doherty.....	645
A note on the reflection coefficient of a sharply bounded ionosphere for VLF signals at the magnetic equator. J. M. de Lisle.....	653

Volume 2 (New Series), No. 7, July 1967

	Page
Influence of high-latitude disturbances on VLF propagation. A. Egeland and E. Naustvik.....	659
Measured amplitude variations of the 19.8 kHz field of NPM near its antipode. F. P. Snyder and J. E. Bickel.....	669
General mode structure and resonant frequencies for ferrite-loaded circularly cylindrical cavity resonators. Donald M. Bolle.....	681
Groundwave attenuation function for propagation over a highly inductive earth. R. J. King and Gerard A. Schlak.....	687
Resonances of the thin-shell model of the earth-ionosphere cavity with a dipolar magnetic field. David B. Large and James R. Wait.....	695
Utilization of the refractive index surfaces to evaluate Cerenkov radiation in an infinite magnetoplasma. R. Sasiela and J. P. Freidberg.....	703
Beam efficiency and gain optimization of antenna arrays with nonuniform spacings. J. K. Butler and H. Unz.....	711
Moment synthesis of array factors with nonuniform spacing and amplitude parameters. A. L. Maffett and T. B. Curtz.....	721
Electromagnetic scattering by thin inhomogeneous circular cylinders. Clayborne D. Taylor.....	729
Computation of HF ground backscatter amplitude. Thomas A. Croft.....	739
Radiation from dipoles in an idealized jungle environment. James R. Wait....	747
John Howard Dellinger memorial lecture. Millett G. Morgan.....	751

Volume 2 (New Series), No. 8, August 1967

	Page
Preface to "Electromagnetic Wave Propagation in Anisotropic Media" papers. Leopold B. Felsen.....	i
Radiation of an antenna in a compressible magnetoplasma. Georges A. Deschamps and Oren B. Kesler.....	757
Ray optics for radiation problems in anisotropic regions with boundaries. I. Line-source excitation. Leopold B. Felsen and Shalom Rosenbaum.....	769
Ray optics for radiation problems in anisotropic regions with boundaries. II. Point-source excitation. H. L. Bertoni and A. Hessel.....	793
Transient radiation of an electrical dipole in a uniaxially anisotropic plasma. S. W. Lee and R. Mittra.....	813
Diffraction by a cylinder in a locally uniaxial medium with azimuthal optic axis. Henry J. Stalzer, Jr. and Jerry Shmoys.....	821
Scaling for rotationally symmetric potential in uniaxial media. George Eichmann.....	833
Aperture fields in an anisotropic medium. E. V. Jull.....	837
Electromagnetic plane wave scattering from a plasma-coated conducting cylinder. R. J. Mayhan and F. V. Schultz.....	853
Propagation of oblique electromagnetic waves through a warm plasma slab with normal magnetostatic field. B. R. Chawla, D. Kalluri, and H. Unz...	869
Reflection of circularly polarized electromagnetic waves from an anisotropic plasma. M. P. Bachynski, B. W. Gibbs, and K. A. Graf.....	881
Propagation in nonuniform slightly gyrotrropic media. Stanley H. Gross...	893
Ionospheric wave theory using coupled vacuum modes. H. Poeverlein.....	905
Full wave solutions in terms of coupled vacuum modes. Edward J. Walsh...	913
Biorthogonal expansions for the linearized anisotropic multifluid warm plasma equations. Maurice I. Sancer.....	927
Mode matching method for anisotropic guides. R. Mittra and S. W. Lee...	937

	Page
Interferometer phase and amplitude measurements for determining coherence ratio and wavefront correlation. Edward J. Fremouw and John M. Lansinger.....	947
Estimation of the number of unresolvable targets producing a single radar return. Petr Beckmann.....	955
Wave propagation in a random medium with parabolic background. C. H. Liu.....	961
Field theory of depolarization of radar backscatter—with application to a distant, slightly rough sphere. A. Erteza and D. H. Lenhert.....	979
Electromagnetic reflectivity of nonuniform jet streams. H. N. Kritikos, K. S. H. Lee, and C. H. Papas.....	991
On the theory of radiation from a raised electric dipole over an inhomogeneous ground plane. James R. Wait.....	997
Electromagnetic whispering gallery modes in a dielectric rod. James R. Wait.....	1005
Dispersion relation in compressible plasma. Yung-Kuang Wu.....	1019
The admittance of cylindrical antennas driven from a coaxial line. D. V. Otto.....	1031
On the electrically thick cylindrical antenna. David C. Chang.....	1043
The thick tubular transmitting antenna. Ronald W. P. King and Tai Tsun Wu.....	1061
On digital computer solutions of Fredholm integral equations of the first and second kind occurring in antenna theory. Charles W. Harrison, Jr., Clayborne D. Taylor, Edward E. O'Donnell, and Eugene A. Aronson.....	1067
Response of transmission lines in proximity to a cylindrical scatterer. Charles W. Harrison, Jr.....	1083
Quasi-static fields of dipole antennas located above the earth's surface. Peter R. Bannister.....	1093
A note on the description of dipole fields. Nicholas Gothard.....	1105
Graphical attenuation calculations for irregular terrain (a digest). Raymond F. Hartman.....	1109
A nomogram for atmospheric radio refraction. A. C. Hudson.....	1113

	Page
Preface to special issue on the analysis of ionograms for electron density. W. J. G. Beynon.....	i
Introductory paper. A review of current methods for obtaining electron-density profiles from ionograms. J. W. Wright and G. H. Smith.....	1119
Ionospheric electron-density profiles with continuous gradients and underlying ionization corrections. I. The mathematical-physical problem of real-height determination from ionograms. Adolf K. Paul.....	1127
Ionospheric electron-density profiles with continuous gradients and underlying ionization corrections. II. Formulation for a digital computer. H. Herbert Howe and Dean E. McKinnis.....	1135
Ionospheric electron-density profiles with continuous gradients and underlying ionization corrections. III. Practical procedures and some instructive examples. J. W. Wright.....	1159
The overlapping-polynomial analysis of ionograms. J. E. Titheridge .....	1169
Direct use of the phase refractive index for reducing $h'(f)$ curves to $N(h)$ profiles. H. Hojo.....	1177
Use of virtual-height slopes for determination of electron-density profiles. Adolf K. Paul.....	1195
On the manual and digital computer methods used at Lindau for the conversion of multifrequency ionograms to electron density-height profiles. W. Becker.....	1205
Ten-point method of ionogram reduction. E. R. Schmerling.....	1233
Direct manual calculations of ionospheric parameters using a single-polynomial analysis. J. E. Titheridge.....	1237
Computation and application of synoptic ionospheric profiles. A. R. Laird and J. W. Wright.....	1255
A quick model method for obtaining real-height parameters from routine ionospheric data. C. Taieb.....	1263
Tables of virtual heights for models of monotonic and nonmonotonic ionospheric layers. Th. Herbert.....	1269
Bibliography. The analysis of ionograms for electron density profiles.....	1278

	Page
Results from an RF capacity probe experiment in the auroral ionosphere. O. Holt and G. M. Lerfeld.....	1283
Results of the two-frequency VLF transmission experiments from Criggion GBZ. A. T. Rawles and B. Burgess.....	1295
Arrays of unequal and unequally spaced dipoles. Weng-Meng Cheong and Ronold W. P. King.....	1303
Log-periodic dipole antenna. Weng-Meng Cheong and Ronold W. P. King...	1315
Effects of induced acoustic sources on the impedance of a cylindrical dipole in a warm plasma. J. Carlin and R. Mittra.....	1327
Diffraction of a dipole field by a perfectly conducting half plane. J. J. Bow- man and T. B. A. Senior.....	1339
Scattering by a two-dimensional periodic array of narrow plates. R. H. Ott, R. G. Kouyoumjian, and L. Peters, Jr.....	1347
On the calculation of antenna patterns for an inhomogeneous spherical earth. Kenneth P. Spies and James R. Wait.....	1361
Multiple scattering in a random continuum. D. A. deWolf.....	1379
Comments on a paper "A numerical investigation of classical approxima- tions used in VLF propagation" by R. A. Pappert, E. E. Gossard, and I. J. Rothmuller. James R. Wait.....	1393
Note on the corona currents in a lightning discharge and the emission of ELF waves. Manoranjan Rao.....	1394
A nomenclature for oblique ionospheric soundings and ray tracing. Kenneth Davies.....	1395
Errata. Leonard S. Taylor.....	1400

	Page
Coupled equations for electroacoustic waves. John Heading.....	1401
Electromagnetic wave scattering from a cylinder immersed in a warm plasma. Edmund K. Miller.....	1411
Power flow from a short antenna in a lossy uniaxial medium. Janis Galejs...	1419
Admittance dependence of the infinite cylindrical antenna upon exciting gap thickness. Edmund K. Miller.....	1431
Scattering from resonant slots on a semi-infinite cone. M. A. Plonus and R. F. Goodrich.....	1437
Electromagnetic radiation in a moving lossy medium. H. Fujioka and N. Kumagai.....	1449
An integral equation approach to scattering from a body of finite conductivity. K. M. Mitzner.....	1459
Numerical application of the compensation theorem to mixed-path propagation problems. Søren Christiansen and Tove Larsen.....	1471
Scattering by two spheres. C. Liang and Y. T. Lo.....	1481
Propagation of VLF waves below anisotropic ionosphere models with a dipping static magnetic field. Janis Galejs.....	1497
Spherical wave propagation through a random continuum. D. A. deWolf...	1513
Transient TEM wave propagation in unbounded radial line. Melvin M. Weiner.....	1517
On the evaluation of Wait's general integrals. R. K. Gupta.....	1521
Note on the tabular presentation of the radio refractive index as a function of meteorological parameters. M. Michael Brady.....	1523
Comments on a paper "Electromagnetic scattering from rough finitely conducting surfaces" by Alex Stogryn. A. K. Fung.....	1525
Reply to A. K. Fung's comments. Alex Stogryn.....	1526
Index to volume 2, January–December 1967.....	1533
Contents of volume 2, January–December 1967.....	ii



